

PARTNERS

The U.S. Department of Transportation's Federal Motor Carrier Safety Administration (FMCSA) managed the field operational test, which was largely funded by the U.S. DOT's Intelligent Transportation Systems Joint Program Office (JPO).

The FMCSA managed the project closely with the Transportation Security Administration and utilized a team of technical experts from the JPO as well as from the Pipeline and Hazardous Materials Safety Administration (formerly the Research and Special Programs Administration), the Federal Highway Administration, and the U.S. DOT Office of Intermodalism.

Battelle led the FOT deployment team, with support from the American Transportation Research Institute; Commercial Vehicle Safety Alliance; QUALCOMM® Incorporated; Spill Center; Total Security Services International; Savi Technology; and Biometric Solutions Group, a division of ISS.

Science Applications International Corporation (SAIC) led the independent evaluation, with support from Cambridge Systematics, Inc.

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- American Trucking Associations
- BP Chemical
- California Highway Patrol
- Commercial Vehicle Safety Alliance
- Cox Petroleum
- Distribution Technologies
- DOW Chemical
- Dupre Transport
- Dyno Nobel
- Dyno Transportation
- Evans Chemical
- ExxonMobil
- GE Betz
- Illinois State Police
- International Association of Chiefs of Police
- International Association of Fire Chiefs
- National Tank Truck Carriers Association
- New York State Police
- NuFarm Americas
- Orica USA
- Quality Distribution
- Roadway Express
- Roeder Cartage
- R&R Trucking
- Texas Department of Public Safety
- Transport Service

HAZMAT FOT Web Site

www.fmcsa.dot.gov/safety-security/hazmat/fot/index.htm

A project-specific Web site was created that provides:

- Overview of the research objectives of the FOT
- Listing of the technologies and partners that participated in the FOT
- Links to the final Deployments and Evaluation Reports
- Technology Compendium that allows users to search by vendor, product name, or technology category or by product attributes.

For more information about the HAZMAT FOT, please contact

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Hazardous Materials Safety and Security Field Operational Test



U.S. Department of Transportation
Federal Motor Carrier Safety Administration

FINDINGS

Evaluation of the test technologies led to the following findings:

- Overall performance for the technologies was good, with most technologies performing well under operational conditions, with the exception of biometric login and electronic seals (e-seals). These technologies require additional product development to be fully adapted for and accepted in the HAZMAT trucking environment (see table on facing page).
- The wireless communications with global positioning system (GPS) tracking provided a positive return on investment for all four of the test scenarios and provided the base for vulnerability reduction, with the additional technologies providing incremental gains.
- The tested technologies showed the capability to reduce the vulnerability of HAZMAT transportation, with the greatest reductions for theft.
- In all cases except the LTL scenario, preventing only one terrorist attack by using the tested technologies over a 3-year period would lead to a tremendous societal cost savings that would far exceed the implementation costs.
- The combined benefit-cost analysis showed positive benefit-cost ratios in all categories, from a low in the LTL environment of 1.4:1 to a high of 96.9:1 in the truckload explosives operations.
- In considering the distribution of overall benefits between private-sector motor carriers and society as a whole, the evaluation indicated that motor carriers would realize a varying percentage of the overall benefits. For LTL carriers, that percentage could exceed 90%, with only 10% of the benefits going to society. On the other hand, a truckload explosives carrier may receive only 1 to 3% of the benefits, with the remaining 97 to 99% going to society in terms of increased security.

| Technologies Tested | FOT Performance Evaluation |
|---|---|
| Wireless Communications with GPS Tracking | Demonstrated ability to integrate additional security functions with the established communications network, providing a reliable data transfer mechanism. |
| Global Login (user name and password) | Provided reliable driver identification at the four carriers who were assigned the technology during the FOT. |
| Biometric Login | Demonstrated new capabilities that ensure vehicle operation by authorized drivers. Improved reliability needed in reading drivers' fingerprints under varying environmental and operational conditions. |
| Electronic Supply Chain Manifest | Tracked chain of custody and access to HAZMAT loads efficiently. Integration with other back-office systems would enhance value and increase usage. |
| Panic Buttons | Demonstrated reliable near real-time notification of security breaches and emergency situations to motor carriers. |
| Geofencing | Rated as significant vulnerability reducers by carriers and industry experts. |
| Electronic Cargo Seals | Demonstrated enhanced capabilities in detecting intrusions into trailers. Improved user interface and e-seal-to-tractor wireless communications need to be developed. |
| Remote Door Lock | Showed promise of being another cargo security solution that could be considered for HAZMAT loads along with e-seals. |
| Tethered and Untethered Trailer Tracking | Demonstrated reliability and accuracy in reporting the locations and status of test trailers. |
| Remote Vehicle Disabling | Provided successful remote vehicle disabling through on-board computers integrated with wireless communications and the vehicle operating system. |
| Public Sector Reporting Center (PSRC) | Showed promise for reducing alert notification times to emergency responders. Additional work needed to better define the public sector's need for such systems. |

Following the events of September 11, 2001, the U.S. Department of Transportation (DOT) expanded and accelerated its efforts to identify areas of vulnerability within the U.S. transportation system. Recognizing the role that technology could play in improving the security of hazardous materials (HAZMAT) transportation, the Federal Motor Carrier Safety Administration (FMCSA) sponsored a field operational test (FOT) and technology evaluation to identify technologies that have the potential to enhance the safety, security, and efficiency of HAZMAT transportation by highway.

The project team assessed the safety and security risks and threats in HAZMAT transportation, identified the primary threats— theft, interception, and legal exploitation—and mapped the threats against four HAZMAT shipment scenarios based on material transported: bulk petroleum, bulk chemical, less-than-truckload (LTL) transportation of HAZMAT, and truckload explosives.

The FOT focused on integrating existing technologies into security applications rather than developing new tools, devices, or systems. The technologies addressed a wide range of vulnerabilities (determined during the risk assessment) and allowed testing of different cost structures.

The four HAZMAT transportation scenarios each included 25 vehicles (100 vehicles total) and deployed a different suite of technologies chosen to address characteristics and operational requirements specific to each segment. These 100 vehicles were operated during a test period of six months.

